Message

From: d'Almeida, Carolyn K. [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=9EC4401AFA1846DD93D52A0DDA973581-CDALMEID]
Sent: 6/23/2016 11:24:16 PM
To: Bo Stewart [Bo@praxis-enviro.com]; Wayne Miller [Miller.Wayne@azdeq.gov]
CC: Davis, Eva [Davis.Eva@epa.gov]; Dan Pope [DPope@css-dynamac.com]
Subject: RE: 2016-6-22 - wafb - FYI - Sodium Sulfate emulsifier summation - ST012 EBR - bstewart praxis summary

"Yes, I recall a meeting that included a lot of discussion of manure, in which the outcome was a much bigger pile of manure with the same mass of persistent chlorinated pesticide at half the concentration."

Are you sure that's not what they are doing here?

From: Bo Stewart [mailto:Bo@praxis-enviro.com]
Sent: Thursday, June 23, 2016 4:22 PM
To: d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Wayne Miller <Miller.Wayne@azdeq.gov>
Cc: Davis, Eva <Davis.Eva@epa.gov>; Dan Pope <DPope@css-dynamac.com>
Subject: Re: 2016-6-22 - wafb - FYI - Sodium Sulfate emulsifier summation - ST012 EBR - bstewart praxis summary

Yes, I'm aware of the origin. I used it to describe the enhanced bio modeling. But I'm afraid I also made an assumption in my liberal use of the term emulsion for expediency.

Yes, I recall a meeting that included a lot of discussion of manure, in which the outcome was a much bigger pile of manure with the same mass of persistent chlorinated pesticide at half the concentration.

On 6/23/2016 4:01 PM, d'Almeida, Carolyn K. wrote:

> Thank you for your very clear explanation, Bo.
>
> It seems you use the word "assume" a lot though. Do you know the origin of the word? ☺
>
> And did you ever hear about the outcome of AF's last bioremediation attempt where they tried to degrade a persistent chlorinated pesticide using only manure and straw? ☺
>
> ---
>
> **From:** Bo Stewart [mailto:Bo@praxis-enviro.com]
> **Sent:** Thursday, June 23, 2016 3:55 PM
> **To:** d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>; Wayne Miller <Miller.Wayne@azdeq.gov>
> **Cc:** Davis, Eva <Davis.Eva@epa.gov>; Dan Pope <DPope@css-dynamac.com>
> **Subject:** Re: 2016-6-22 - wafb - FYI - Sodium Sulfate emulsifier summation - ST012 EBR - bstewart praxis summary
>
> Hi Carolyn,

I hope Wayne doesn't mind if I speak directly. Dissolution of BTEXN from the remaining LNAPL is tricky. If it happens rapidly compared to degradation, as you point out, the plume will grow. On the other hand, if dissolution happens very slowly (or BTEXN content in the LNAPL is low) and degradation is fast enough then MNA becomes a good way to go. ADEQ has commented on the middle condition where the dissolution from LNAPL with significant BTEXN content is fast enough and degradation slow enough that groundwater concentrations stay well above MCL for a long time. Enhanced bio could eliminate much of the dissolved contaminant in the short term. But after the enhancement ends, the groundwater concentrations return to nearly the same concentrations if the source LNAPL is not significantly altered.

In the modeling presented by the AF, it is assumed the BTEXN dissolve from the LNAPL into adjacent groundwater instantaneously and are available for degradation. The time associated with NAPL mass transfer limitations is not considered. This is a common assumption but not realistic and could extend the remediation time frame well beyond 20 years.

Bo

On 6/23/2016 3:09 PM, d'Almeida, Carolyn K. wrote:

> Thank you Bo, this is much clearer now.
>
> I am still hung up on dissolution vs dispersion and very concerned about potential to spread much faster than degrade.
>
> **From:** Wayne Miller [mailto:Miller.Wayne@azdeq.gov]
> **Sent:** Thursday, June 23, 2016 3:03 PM
> **To:** d'Almeida, Carolyn K. <dAlmeida.Carolyn@epa.gov>
> **Subject:** 2016-6-22 - wafb - FYI - Sodium Sulfate emulsifier summation - ST012 EBR - bstewart praxis summary
>
> FYI – Summation provided to me by UXO Pro/Praxis
>
> **From:** Bo Stewart [mailto:Bo@praxis-enviro.com]
> **Sent:** Wednesday, June 22, 2016 5:28 PM
> **To:** Wayne Miller <Miller.Wayne@azdeq.gov>; steve <steve@uxopro.com>
> **Subject:** 2016-6-22 - wafb - Sodium Sulfate emulsifier - ST012 SEE to EBR - bstewart praxis
>
> Don described it this way on the call today, somewhat. The sulfate has surfactant properties but not really for mobilizing NAPL as much as emulsifying to increase surface area for dissolution and bacteria interaction. The sulfate makes the compounds available to the bacteria (abiotic). But this requires contact between the sulfate and NAPL. This is all relatively unproven for a field application like this one but the process is well kno. The associated biological process is anaerobic and slow; therefore, increasing the rate by a factor of 2 to 5 (published literature) still yields a slow process compared to aerobic degradation processes. I have

stayed out of this issue and don't know why air sparging was not considered or was eliminated.

More commonly, persulfate is injected as an oxidant and the reaction products include sulfate to increase biological degradation after the reaction. It can also be combined with calcium peroxide to prolong the effect. But this can get expensive ...

On 6/22/2016 4:51 PM, Wayne Miller wrote:

FYI -

From: d'Almeida, Carolyn K. [mailto:dAlmeida.Carolyn@epa.gov]
Sent: Wednesday, June 22, 2016 4:43 PM
To: Davis, Eva <Davis.Eva@epa.gov>; Dan Pope <DPope@css-dynamac.com>; Wayne Miller <Miller.Wayne@azdeq.gov>
Subject: 2016-6-22 - wafb - Sodium Sulfate is mostly a surfactant - ST012 SEE to EBR - cda epa

Talking with Rosemarie's bio expert and checking on line, it appears to be more of a abiotic reaction

Carolyn d'Almeida
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(415) 972-3150

"Because a waste is a terrible thing to mind..."

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Lloyd "Bo" Stewart, PhD, PE
Praxis Environmental Tech., Inc.

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Praxis Environmental Tech., Inc.